

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

176
31 Sum
op 3

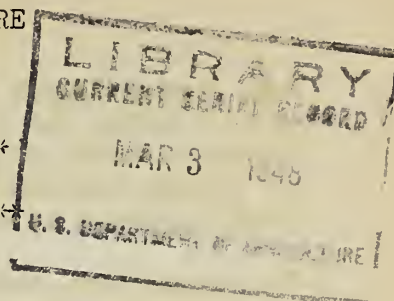
UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for

SOIL CONSERVATION SERVICE RESEARCH**

NOVEMBER 1947



EROSION CONTROL PRACTICES DIVISION

Weed Seeds in Threshed Wheat in Relation to Tillage Practices -

C. L. Englehorn, Fargo, North Dakota.-"At the time of threshing of the tillage plots at Edgeley and Langdon samples of wheat were taken from each plot for determination of the protein and phosphorous content as these may vary between the methods of tillage used. These samples were hand cleaned in preparation for analysis. This afforded an opportunity to determine the extent to which the presence of weed seeds in the wheat varied between the methods of tillage..

"At Edgeley the samples of wheat from both the fallow plots and those continuously cropped to wheat were quite free of weed seeds. No wild oats and only small quantities of wild buckwheat and other small seeds constituting less than one percent by weight occurred. Variations in weed seed content between method of tillage were not apparent. At Langdon, wheat samples from the continuous wheat plots contained considerable quantities of wild oats and smaller quantities of wild buckwheat, yellow mustard and lambs-quarters. The percent by weight of weed seeds according to the method of tillage used for seedbed preparation at Langdon are included in the following table.

	% of weed seeds in wheat from tillage plots				
	Spring plow	Fall plow	Stubble mulch	Oneway	Field Cultivator
Wild oats	3.9	3.9	5.9	6.9	11.8
Miscellaneous	0.3	0.4	0.7	0.4	0.5
Total	4.2	4.3	6.6	7.3	12.3

*This report is for in-Service use only and should not be used for publication without permission from the Washington Office, Soil Conservation Service.

**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"The lesser amount of wild oats, 3.9 percent, was found in wheat from the plowed plots, due perhaps to the fact that more of the seeds are buried at depths at which they may not germinate. Wheat from the more 'trashy' type of tillage contained higher quantities of wild oats. The greatest percent, 11.8, occurred in wheat from plots tilled with the field cultivator.

"In comparison, wheat from summer fallow at Langdon contained only a trace of wild oats and an average of 0.7% of total weed seeds, largely wild buckwheat, yellow mustard and lambsquarters. No apparent variation occurred between plowed fallow, stubble mulch fallow or fallow tilled by means of field cultivator."

Weed Control Tests on Wheat Land - F. L. Duley, Lincoln, Nebraska.-

"Some tests have been made with various pieces of equipment for eradicating volunteer wheat. A combination of a subsurface tiller or rod weeder, followed by skew treading has been the most successful. We are cooperating with Neal Hanson, of the Department of Agronomy, in testing the effect of 2,4-D in eradicating volunteer wheat.

Spring Applications of Straw in Relation to Rates of Nitrification in Soil -

"Tests have been made by T. M. McCalla on the rate of nitrification in soils from plots receiving different amounts of straw in spring. The samples were stored for 5 weeks at 28° C and optimum moisture from September 27 to October 31, 1947.

Treatment		Nitrate-nitrogen - P.p.m.			
		Start of incubation		End of incubation	
Straw	Tillage	0-1"	1-6"	0-1"	1-6"
None	Plowed	58	28	33	26
None	Subtilled	63	39	73	39
2 tons	Subtilled	42	23	73	41
4 tons	Subtilled	52	24	101	52
8 tons	Subtilled	33	15	66	47

"It will be noted that those plots receiving mulch treatments showed the greatest tendency to produce nitrates when favorable conditions prevailed.

"Tests have been made on plots during 1947 for possible production of nitrites. These compounds if present might give some detrimental effects on growth. The results to date show only about 2 p.p.m. of nitrite and no significant difference between plowed and subtilled land.

Straw Applications and Tillage Practices in Relation to Soil Resistance to Falling Water Drops - "The resistance of these soils to falling water drops, which indicates the stability of the structure, was as follows:

Treatment		No. drops required to destroy soil lumps			
		April 25, 1947		Sept. 25, 1947	
Straw	Tillage	0-1"	1-6"	0-1"	1-6"
None	Plowed	4.5	8.2	11.8	12.6
None	Subtilled	5.4	9.5	8.8	13.6
2 tons	Subtilled	15.8	17.0	13.8	17.9
4 tons	Subtilled	30.8	30.1	23.0	28.9
8 tons	Subtilled	45.5	38.6	39.8	31.7

"These results indicate some increase during 5 summer months in the stability of the soil where no straw had been added, but no significant change where there was straw on the surface."

Fall Plowing Increased Nitrate Formation During Fallow Season -
 Hugh C. McKay, St. Anthony, Idaho.--"The method of handling legumes and grasses in a soil conserving crop rotation determines to a large extent the amount of nitrate formation during the fallow season. The following table gives the pounds of nitrogen as nitrate in the soil at seeding time.

<u>Rotation</u>	<u>Pounds N as NO₃ at time of seeding for first 2 feet of soil</u>
Check	48
Sw clover	48
Sw clover & grass	42
Alfalfa	150
Alfalfa & grass	199
Grass	122

"The sweet clover and the sweet clover and grass plots did not increase the amount of nitrates over the check because when they were plowed they were relatively dry and there was not sufficient moisture received during the fallow season for nitrate production.

"The alfalfa, the alfalfa and grass and the grass plots all showed much more nitrate development. These were all fall plowed and worked down the first thing in the spring. Fall plowing not only increases the nitrate development but it also increases the yield of the following wheat crop, over spring plowing. This was especially true for the straight grass plot, which used to be one of the poorest plots in the rotations, but changing from spring plowing to fall plowing made it one of the best. When it is fall plowed it is left rough over winter and then worked down immediately in the spring; this leaves it in a more favorable condition for nitrate development."

Corn Yield in Relation to Land Management - B. H. Hendrickson,
 Watkinsville, Georgia.--"Mr. A. P. Barnett secured the following 1947 average corn yield data from triplicate sample areas in fields on the 100-acre tenant-operated farm:

<u>Land Class</u>	<u>Cropping</u>	<u>Corn Variety</u>	<u>Corn Yield bushel/acre</u>
I and II	Continuous corn with inter-planted crotalaria	Mathewson's	30
II	Corn in rotation following 2 years of small grain and Kobe lesp.	Mathewson's	38
II	Corn, after 1 year of small grain-Kobe lespedeza	Tenn. No. 10 hybrid	41
III	Corn, after 2 years of small grain-Kobe lespedeza	Tenn. No. 10 hybrid	36
III	Corn, after 5 years Sericea	Tenn. No. 10 hybrid	45

"Corn stalks, the crotalaria and practically the full combine residues of small grain, Kobe lespedeza and sericea remained on the fields. All of the corn was grown in 42 inch rows, spaced approximately 22 inches in the row, and received 300 pounds per acre 3-9-6 fertilizer in the row and 150 pounds per acre nitrate of soda side dressing.

"When these 1947 corn yields were graphed, using the number of prior years of grain-lespedeza and sericea residue accumulations for the horizontal scale, the following interesting trends were noted: Class II land was 22 percent more productive of corn than Class III land, and responded better than Class III to these residue practices; the hybrid corn was the better yielder by about 20 percent; and the extent of increase in hybrid corn production per prior year of mostly legume residue accumulation averaged 10 percent per year on Class III land.

"Mr. William E. Adam's summarized 5-year average corn yield rotation plot data indicates that corn was 30 percent more productive on Class II land than on Class III land. Also, on Class III land only, a 2-year rotation of cotton-vetch, corn produced 15 bushels per acre of corn. Adding crotalaria in the corn year raised the corn yield to 27.5 bushels per acre. In 4-year rotations, substituting 2 full years of lespedeza for crotalaria and including an oat crop raised the corn yield to 32.0 bushels per acre. Three full years of kudzu ahead of the corn year resulted in an average corn yield of 41.0 bushels per acre.

Peanut Production in Relation to Land Management - "An important cash crop in Georgia is peanuts. Mr. Adam's 4-year average plot data follows: continuous peanuts produced 1063 pounds per acre; peanuts grown annually with vetch cover crop each winter turned for green manure yielded 1172 pounds per acre; a 2-year rotation of peanuts, followed by oats / vetch for hay then by volunteer crotalaria produced 1843 pounds per acre of peanuts.

"Three points stand out: (1) if there has been considerable past erosion, the land is less productive, less responsive and less profitable; (2) legume residues are much more effective than legume green manures for soil improvement purposes; and (3) land not too badly eroded can be gradually brought back to fairly good productive levels for corn production by the use of practical rotations designed for the purpose."

First-Year Corn Doubled the Yield of Second-Year Corn in 1947 -
G. M. Browning, Ames, Iowa. - "Averaging 4 rotations in which corn was grown two years in succession, first year corn yielded 50.2 bushels per acre and second year corn 24.1 or an increase of first year corn over second year corn of about 108%. These figures may be subject to slight revision after final calculations have been completed.

Contouring Versus Up and Down Hill Cultivation of Corn Along Highway 64 in Marshall County, Iowa - "Studies comparing contouring versus up and down hill cultivation of corn in cooperation with farmers was limited to Marshall County this year. The town of Melbourne in Marshall County has been particularly anxious to sponsor work relating to soil and water conservation. Very few practices such as contouring, strip cropping or terracing were being used by farmers in that area. It was the plan of this group to encourage all farmers in Marshall county that had land joining Highway 64 to plant the intertilled fields on the contour. Of the farmers in this project 12 were agreeable to planting areas adjacent to the Highway on the contour and leaving 20 - 24 rows up and down hill adjacent to the fence to compare differences in yields and stands for contouring versus up and down hill. As an average of the 12 fields samples, the contoured areas yielded 70.2 bushels per acre and the up and down hill areas 42.1 bushels per acre or a difference of 28.1 bushels in favor of contouring. This is a much larger difference than was obtained as an average for any previous year. It is, however, not larger than was found in specific locations on the steep Ida areas in western Iowa where differences of this size have been frequently found. The reason for the large differences is explained largely by the large reduction in stand on the up and down hill areas. The contoured areas had an average stand per acre of 11,970 stalks and the up and down hill 6,643 which is only slightly more than half as much as on contoured areas. This year there was a series of very intense rains in that particular area in which many of the up and down hill areas were severely damaged or in cases completely washed out. While the results for this particular year are much larger than the average figures which we have obtained over a 5-year period they do represent a condition that can occur in a particular year when rains of high intensity occur."

Strip Cropping Saved Soil and Water - George W. Hood, Batesville, Arkansas. - "Strip crop showed up exceptionally well in 1947 and produced the smallest soil loss. The soil and water loss on the Ozark soil on the strip crop plots was 0.56 of a ton per acre of soil and 0.620 of an inch of rain as contrasted with the check of 10.76 tons of soil and 2.211 inches of rain.

Rotations Saved Soil on Cotton Land - "On the Baxter soil, where a three year rotation is practiced with the same crops and conditions as on the Ozark soil, we find the loss is greater where a single crop occupies the soil. The loss of soil from cotton in rotation on contour was 1.72 tons. Corn, 1.38 of a ton and oats 0.87 of a ton per acre as compared with continuous cotton on the contour of 2.51 tons, and continuous cotton with the slope of 4.15 tons per acre."

Short Grasses Slow to Recover From Drouth - C. J. Whitfield, Amarillo, Texas.-"Forage production during the past year is of interest. In spite of good fall and winter moisture and short grasses failed to recover from the drought in 1945 and 1946, as did the mid cool season grasses. Clippings made in April and July 1947 showed the following production yields:

Pasture I-1	Blue grama buffalo grass	294
Pasture F-2	Western Wheat grass	1669
Pasture I-4	Crested wheat grass	2244

"Western wheat and crested wheat were mature with and had an excellent seed crop when clipped in July. The short grasses on the other hand had made very little seed and was drying up due to the hot dry weather."

Character of Rainfall in Relation to Effects of Conservation Practices - O. R. Neal, New Brunswick, New Jersey.-"In our September report it was stated that differences in runoff and crop yield between good and poor soil management treatments were less during 1947 than in previous years. It was suggested that this might be due to unusually low rainfall intensities during the 1947 growing season. If rain falls at a sufficiently low rate the water may be absorbed in equal amounts by soils of either good or comparatively poor physical properties. Little or no runoff will occur from either condition.

"Analysis of rainfall characteristics for 1947 and preceding years shows that the 1947 year was characterized by relatively good distribution and by low rainfall intensity as compared with other years of record. The distribution is indicated by the fact that extended periods with little or no rainfall were shorter and less numerous during the 1947 growing season than in previous years. Rainfall intensity during the past season was below the 10-year average and was much lower than in the 1946 year.

"During the 1947 growing period just over 6 inches of rain fell at an intensity equal or greater than 1.00 in./hr. In 1946 the figure was over 11.00 inches. Four and a half inches fell at or above 1.50 in./hr. in 1947 as compared with almost 9 inches in 1946. At an intensity of 2.00 in./hr. the corresponding amounts were 3-1/4 inches and 7 inches.

"Rainfall intensity is known to be an important factor in influencing runoff. In our studies of the value of contour planting in comparison with up-and-down slope planting, both sweet corn and potato yields were markedly increased by contouring during 1945 and 1946. In the current year sweet corn yields were essentially the same under the two systems and potato yields were only slightly increased by contouring. It appears that rainfall intensity was sufficiently low so that little runoff occurred from the up-and down slope planting. As a result essentially equal amounts of soil moisture were available for plant growth under the two planting systems."

Additional Data on Corn Yields in Relation to Past Land Management at the Arnot - G. R. Free, Marcellus, New York.-"Yields of corn (grain) obtained from erosion plots at the Arnot have been previously presented. These plots, under various systems of soil management which permitted great differences in amount of erosion during the period 1935-45, were fertilized in 1946 with 1,000 pounds per acre of 10-10-10 and all cropped to corn. The same fertilization and crop were used in 1947.

"The following analysis of these yields on basis of total dry matter makes use of yield data from plots which were in corn continuously or in a rotation which included corn during the period 1935-45. All treatments started in 1935 but data are given only for those years when rotation plots were in corn.

Management 1935-45	Soil loss 1935-1945 Tons/acre	Yields of dry matter on basis of rotation- fertilized plot yield as 100 percent				
		1937	1940	1943	1946	1947
Rotation-fertilized	3	100 (9008)1/	100 (3730)1/	100 (6172)1/	100 (5700)1/	100 (5090)1/
Idle	2	-	-	-	138	142
Meadow-fertilized	0	-	-	-	132	117
Rotation-unfertilized	8	79	69	42	76	94
Cont. corn-fertilized	34	46	45	23	51	51
Cont. corn-unfertilized	48	33	18	7	46	36
Fallow-stones in place	74	-	-	-	35	42
Fallow-stones removed	138	-	-	-	78	62

1/ Data in parenthesis are pounds per acre.

"These data show the value of sod either as continuous meadow, idle land, or in a rotation in conserving soil and also in conserving the ability to respond satisfactorily and quickly to heavy fertilization. The plots under continuous corn show a high rate of soil loss and declining yields. Heavy fertilization after continuous corn has given large increases in yields. However, these yields are low when compared with those resulting from the same fertilization following good management including erosion control."

Summary of Field Studies on the Effect of Past Erosion on Crop Yields - John Lamb, Jr., Ithaca, New York.-"The yields noted below came from areas in the same field where difference in erosion was noted by erosion survey standards. Usually this was the difference between 1 and 2 erosion. This varies from the effect of recent erosion as measured at the erosion experiment stations, presented in this and other reports. There, selective sheet erosion, relatively small in amount in most cases as measured in inches of soil, caused great differences in the yields of the next crop. But there may be considerable yield recovery in a few years with a good rotation and effective fertilization. But erosion scars that are tagged class 2 are likely to last a long time.

Year	Location	Soil	Crop	Unit ¹	Yields		
					Eroded	Less eroded	Per cent increase
1942	Steuben County	Bath	Potatoes	Bushels	347	413	19
1942	Steuben County	Bath	Potatoes	Bushels	413	441	7
1942	Steuben County	Bath	Potatoes	Bushels	441	517	17
1943	Marcellus Station	Honeoye	Corn	Lbs dry matter	5823	7193	24
1943	Allegany County	Erie	Oats	Bushels	23	38	65
1943	Steuben County	Bath	Potatoes	Bushels	187	251	34
1943	Steuben County	Bath	Potatoes	Bushels	251	353	41
1943	Wyoming County	Darien	Beans	Bushels	5	14	180
1943	Chenango County	Canfield	Corn	Tons ensilage	7.2	11.8	64
1943	Geneva Station	Dunkirk	Sweet corn	Tons	3.2	4.7	47
1943	Geneva Station	Dunkirk	Cabbage	Tons	13.8	16.7	21
1943	Yates County	Lansing	Grapes	Tons	0.5	1.5	200
1943	Yates County	Lansing	Grapes	Tons	1.5	2.6	73
1943	Ontario County	Camillus	Rose plants	No./100' row	38	67	76
1944	Marcellus Station	Honeoye	Oats	Bushels	27	34	26
1945	Geneva Station	Dunkirk	Sweet corn	Dozen ears	852	934	10
1945	Geneva Station	Dunkirk	Sweet corn	Dozen ears	934	964	3
1945	Marcellus Station	Honeoye	Hay	lbs dry matter	1569	3032	93
1946	Chautauqua County	Alton	Grapes	lbs per vine	2.5	5.1	104
1946	Chautauqua County	Alton	Grapes	lbs per vine	5.1	6.5	27
1946	Chautauqua County	Alton	Grapes	lbs per vine	5.5	8.2	49
1946	Chautauqua County	Alton	Grapes	lbs per vine	8.2	10.3	26
1946	Geneva Station	Dunkirk	Beets	lbs/100' row	108	150	39
1946	Geneva Station	Dunkirk	Beets	lbs/100' row	150	124 ²	-17

¹/ Per acre unless otherwise stated. ²/ Deposit."

Permeability Tests on Four Tight Soils in Illinois - C. A. Van Doren, Urbana, Illinois. - "The period September through November was characterized by low intensity rainfall that did not produce runoff. Precipitation in September and November approximated one inch below average. The dry period that started in late July and carried over into September was largely responsible for a decrease in yield and quality of corn produced on our plots.

"Field permability runs and laboratory percolation tests were made during October and November on four tight soils in northeastern Illinois that need drainage. Mr. R. E. Uhland spent several days in Illinois helping standardize techniques and assisting with field and laboratory tests.

"In the field permeability was measured on the A1, A2, B, and C horizons. Three inch soil cores were taken from these horizons, saturated in the laboratory, and run for one hour on a percolation table, then drained for one hour at 60 cm. tension to get a measure of drainage and pores drained under tension. The Rowe and Bryce soils were very tight and allowed very little infiltration and percolation (Table I). On the basis of this limited information, it would appear that the installation of a tile system in these soils could not be recommended. The Drummer and Ashkum soils were much more permeable. Drummer has been successfully drained and is generally regarded

as a soil that is benefited by drainage. From these tests, Ashkum appears to be better drained in the A and B horizons, but not as well drained in the C horizon as the Drummer. It would appear that Ashkum would be benefited by drainage if the tile were placed above the C horizon. Drainage appears to be better on the Drummer soil that is growing an alfalfa crop than on the Drummer that is in corn.

Table I - Intake of Water and Pores Drained from Selected Level to Depressional Soil Types in Northeastern Illinois (1)

Horizon	Sample	Rowe C. L.		Bryce C. L.		Ashkum C. L.		Drummer C.L.	
		Intake In/Hr.	Pores Drained cc	Intake In/Hr.	Pores Drained cc	Intake In/Hr.	Pores Drained cc	Intake In/Hr.	Pores Drained cc
A1 (3")	Field	-	-	0.88	-	0.05	-	0.11	-
	Core	0.09	7.2	1.67	31.8	0.32	16.6	4.39	29.8
A2 (9")	Field	-	-	0.11	-	-	-	0.23	-
	Core	0.19	9.5	0.17	10.0	-	-	2.02	22.4
B (16")	Field	-	-	0.12	-	1.18	-	0.54	-
	Core	0.13	6.8	0.09	7.5	5.51	19.0	1.46	17.4
C (27")	Field	-	-	0.41	-	0.44	-	1.38	-
	Core	0.10	6.2	0.07	10.0	0.93	19.3	2.25	19.4

(1) Tests conducted in corn fields.

"The data indicate a general relationship between cc of pores drained in one hour at 60 cm. tension and permeability."

Wind Erosion in Relation to Management of Crop Residues - Ralph A. Cline, Brookings, South Dakota, - "Poor weather conditions during October prevented completion of the soil removal study by the wind tunnel. Many factors affecting the initiation of soil movement such as density of air, humidity, temperature, air pressure, ground temperature and moisture content of soil entered into the 1947 results. Soil losses in 1947 were lowest on oneway disking; next lowest on moldboard plowing, and highest on subsurface tillage which is almost a complete reversal of the trend of previous years. When the effect of residue under any one tillage is compared, those plots where very little or no residue was returned lost the greatest amount of soil, while the 6 inch stubble lost the least soil. Heretofore, the plots where all the previous crop residue (wheat stubble) was returned lost the least soil. The average number of tons of soil lost per acre from corn stubble during the period 1942 through 1947 are as follows:

"As shown in the table, leaving the crop residue on the surface affords the most protection to wind erosion; regardless of previous tillage, the greatest amount of soil is conserved where all the previous crop residue is returned; the addition of manure (8 tons per acre) to 6 inch stubble gives no more protection to wind erosion than 6 inch stubble without manure; mowed stubble gives the most protection when incorporated with the surface soil; and, soil losses are greater from 12 inch stubble than 6 inch stubble with or without manure.

Wheat Stubble Previous Year	Wind	Amount of soil in tons per acre eroded			Average
	Velocity	in 10 minutes when stubble tilled with			loss
	at 18"ht. M.P.H.	Subsurface Tiller	Oneway Disc	Moldboard Plow	for residue
Mowed stubble	40	3.50	2.75	3.11	3.12
6" stubble	40	2.18	2.81	2.78	2.59
6" stubble + manure	40	2.36	2.44	2.87	2.56
12" stubble	40	2.46	2.87	3.42	2.92
All residue	40	1.63	2.28	2.55	2.15
Average		2.43	2.63	2.95	

Yields of Field Cured Sorghum Forage in 1947, As Influenced by Tillage, Residue Management and Crop Rotation at the Central Substation, Highmore, S.D.-

Residue Treatment	Sorghum, Wheat, Oats rotation		Sorghum, Wheat rotation
	Plow	Subtilled	Subtilled
	lbs/A	lbs/A	lbs/A
6" straw	3059	2556	3813
6" straw + manure	3520	2137	4243
All straw	3269	3269	4148
Average	3284	2654	4068

"The yield data show a 1414 lb. advantage for subsurface tillage in a 2 year rotation over subsurface tillage in a 3 year rotation and 784 lb. advantage over plowing in a 3 year rotation. The highest yield in the 3 year rotation was obtained where manure had been applied at the rate of 8 tons per acre to 6 inch stubble and plowed under. Subsurface tillage under similar residue treatment produced the poorest yield or 1383 lbs. less forage than plots that were plowed."

Soil Losses From Grain Land - O. E. Hays, LaCrosse, Wisconsin.-

"For the past six years soil losses have been higher from spring grain than from corn land. In rotations where corn follows hay, a considerable amount of organic matter in the form of green manure is returned to the soil. If the hay is a mixture of grass and legumes, good soil structure results which will increase the amount of infiltration and decrease runoff and soil loss. Land that is planted to grain following a year of cultivation of corn is low in organic matter and is of poor structure. The soil runs together and seals over if a hard rain occurs soon after seeding.

"Losses from grain can be reduced in two ways. One is to plant fall grains. It has been shown that soil loss from fall grain is about one-half as much as from spring grain. However, considerable difficulty has been encountered in seeding legumes in fall grain. There is insufficient time in the fall to seed legumes and grass in the corn. Seeding in corn should be done in July in order for the legumes to become sufficiently well established to withstand the severe winters. Spring seeding of legumes and grass in fall-seeded grain has not proven too successful due to the competition given by the established grain.

"Another method of reducing losses from grain, and probably more practical is to apply a light dressing of barnyard manure on grain land. Such an application is very effective because the period over which grain lands erode is rather short - usually limited to about three months.

"In the organic matter series, manure was applied to two plots in the fall before plowing and to two plots this spring after all seeding operations had been completed. The rate of application was five tons per acre.

"Soil and water losses from duplicate plots during six runoff periods are shown in the following table.

Soil and Water Losses - Organic Matter Plots

1947 Date	Precip. Amount	No Treatment		Barnyard Manure Plowed Under		Barnyard Manure Surface Applied	
		Plot 1		Plot 2		Plot 4	
		Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A
5/22	0.60	.03	.00	.02	.00	.02	.00
6/7	0.44	.08	.00	.03	.00	.02	.00
6/12-13	3.02	.65	1.27	.17	.07	.14	.04
6/27	0.94	.32	.34	.17	.11	.22	.10
6/28-30	1.59	.58	.23	.37	.07	.31	.04
7/3	0.51	.28	.22	.15	.09	.16	.04
Total		1.94	2.06	.91	.34	.87	.22
5/22	0.60	Plot 9		Plot 6		Plot 10	
		Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A
		Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A	Runoff Inches	Soil Loss T/A
5/22	0.60	.03	.00	.02	.00	.02	.00
6/7	0.44	.06	.00	.06	.00	.00	.00
6/12-13	3.02	1.03	1.63	.63	.26	.27	.07
6/27	0.94	.35	.72	.33	.38	.11	.05
6/28-30	1.59	.68	.37	.56	.23	.09	.01
7/3	0.51	.31	.47	.28	.33	.05	.02
Total		2.46	3.19	1.88	1.20	.54	.15
Average, 2 plots		2.20	2.62	1.40	0.77	0.70	0.18

"It would seem from data available that a part of the barnyard manure could advantageously be applied on grain land which is naturally low in raw organic matter. On soils that are not too heavy such a treatment will result in reduced runoff and soil loss as well as increased yield of grain. No difficulty from lodging has been experienced on the Fayette silt loam as long as the available potassium in the soil is fairly high."

Formation of Water-Stable Soil Aggregates by Earthworms - Roy C. Dawson, College Park, Maryland.-"Studies were made on the microflora of the earthworm in relation to the formation of water-stable soil aggregates by the earthworm. It was shown that upon incubation at 6° C for 7 days in Christiana silt loam, aggregates were formed in the intestines of the earthworm (*Lumbricus terrestris*) which were very resistant to the action of falling water drops. The bacterial populations of these aggregates were significantly lower than those of the unstable, worm-free soil. Aggregates

excreted by the earthworms were less stable and contained greater numbers of bacteria than those removed from the intestinal tract of the worm. The evidence obtained indicates that, under the conditions of the experiment, water-stable aggregates were formed within the intestinal tract of the earthworm. Apparently the earthworm itself, rather than its microflora, was an important factor in the formation of water-stable soil aggregates."

1947 Yield Data on Two Sets of Orchard Soil Management Practices -
John T. Bregger, Clemson, South Carolina.-

Table 1. Effects of conservation practices on peach tree size yields*

Soil Management Practice	Average Yield in Bushels 1947
Clean cultivation-(no cover crop)-	6.9
Grain straw mulch	8.0
Sorghum pomace mulch	5.5
Lespedeza sericea (all)	4.75
Lespedeza sericea (unmowed)	4.9
Lespedeza sericea (mowed)	4.6
Annual lespedeza (Kobe) all plots	5.25
Annual lespedeza (Kobe) (unmowed)	4.7
Annual lespedeza (Kobe) (mowed)	5.8
Soybeans -- Sudan grass (All)	7.4
Soybeans -- Sudan grass (unmowed)	6.3
Soybeans -- Sudan grass (mowed)	8.5
Vetch; summer cover crop (all)	7.35
Vetch; soybeans	7.35
Vetch; crabgrass	7.35
Rye; summer cover crop (all)	6.3
Rye; soybeans	6.5
Rye; crabgrass	6.05
Vetch plots - seedbed preparation only	7.0
Vetch plots - 1-1/2 months cultivation	7.9
Vetch plots - 3 months cultivation	7.1
Rye plots - seedbed preparation only	6.3
Rye plots - 1-1/2 months cultivation	6.65
Rye plots - 3 months cultivation	5.85
Vetch plots - cover crop residues on surface	8.0
Vetch plots - cover crop residues turned under	6.7
Rye plots - cover crop residues on surface	7.1
Rye plots - cover crop residue turned under	5.45
Soybean plots - cover crop residue on surface	7.75
Soybean plots - cover crop residue turned under	6.1
Crabgrass plots - cover crop residue on surface	7.3
Crabgrass plots - cover crop residue turned under	6.1

*Orchard planted 1939. No fruit crop in 1943.

Table 2. Effects of certain cover crop species and management practices on tree size and yields*

Soil Management Practice	Average tree yield in bushels
Vetch (winter cover crop); summer cultivation	6.45
Crotalaria spectabilis, (summer cover crop); winter residue	5.25
Clean cultivation (fallow)	5.3
Soybeans-Sudan grass summer cover crop; winter residues	5.25
Korean lespedeza; spring tillage	5.0
Korean lespedeza; no tillage	4.55
Korean lespedeza (summer cover crop) with rye (winter c.c.)	4.55
Rye winter cover crop; spring mowing	5.2
Rye winter cover crop; spring tillage	4.5
So. spotted bur clover (winter cover crop)	4.85

*Orchard planted 1941.

"In analyzing the data in Table 1, it will be seen that the grain straw mulch and soybeans-Sudan grass mowed (also a type of mulching) 'led the field' in 1947. Considering the fact that this has been one of the driest seasons on record, it is not surprising that mulching has shown its ability to conserve soil moisture in this manner.

"Vetch, the winter legume, was again superior to rye, the winter non-legume. Clean cultivation falls in between showing that the rye residues reduce yields as much by tying up nitrogen as vetch increases them by furnishing additional nitrogen.

"Annual and perennial lespedeza have continued to gain over the previous season, indicating that their early effects in holding down tree growth is gradually wearing off. The sericea plots especially showed an ample supply of nitrogen and water by maintaining dark green foliage throughout the year. How this could be in spite of the unprecedented drought remains a mystery. Mowing also gave no significant benefits in the case of this perennial.

"As in previous years a medium period of summer cultivation (1-1/2 months) proved superior to the double period (3 months). Also the leaving of both winter and summer cover crop residues on the soil surface is far better than burying them through a more intensive type of tillage.

"Table 2 involves a different set of soil management practices though a few are carried over from the older set of plots. Here again vetch is proving far superior to rye as a winter cover crop, though in mowing the rye more nitrogen tends to be available with favorable results on tree growth and fruit yields.

"The two summer cover crops, which are held over as winter mulch and then disked into the soil in the spring, are a close second to vetch. The difference between Crotalaria and soybeans-Sudan grass is not evident this year, and neither have brought about a significantly lower yield over clean cultivation. The important factor in all favorable treatments appears to be tillage of the soil during the critical growth period immediately after fruit bloom together with the presence of sufficient soil nitrates and moisture to allow optimum shoot and fruit growth."

Comparative Production of Pasture Areas 1947 - Dwight D. Smith,
Columbia, Missouri.-

Plot	Species	Pounds per acre	Animal Days Per Acre	Pounds Per Animal Days
II - 3	Wheat & Korean lespedeza	481	230	2.09
6	Bromegrass & sweet clover	389	159	2.44
5	Timothy, sweet clover & lespedeza	307	149	2.06
2	Lepedeza (following oats for hay)	251	115	2.18
7	Bluegrass, renovated 1942	184	191	0.96
10	Bluegrass, renovated 1947	145	65	2.23
8	Bluegrass, check	139	101	1.37
1	Timothy & lespedeza	178	123	1.44
9	Bluegrass, contour furrows	88	101	0.87
4	Barley (prior to seeding soybeans)	88	39	2.25
Reclama- tion				
1	Second-year sweet clover	325	172	1.88
2	First-year sweet clover	106	72	1.14
3	Rye (grazed in spring only)	89	65	1.36

Effect of 2,4-D, Deisel Oil, or Ammate Mixtures on Brush in
Oklahoma - Harley A. Daniel, Guthrie, Oklahoma.-"The following table gives the results obtained by Harry M. Elwell and Clifford C. Elder with contact sprays for the control of brush. These results show that some types of brush are resistant to 2,4-D, but a number of conditions influence the effect of kill. Ammate usually gives positive effect on all types of brush. This material when used at the strength required to control brush will burn the native grasses. In an effort to overcome this difficulty a mixture of Ammate and 2,4-D and deisel oil and 2,4-D were used. It appears from this years' results that the 2,4-D and deisel oil or Ammate and 2,4-D mixture was more effective on trees. It also appears that these mixtures may reduce the cost of treatment. From the studies made at Guthrie, and in field trials elsewhere, 2,4-D in water solution did not give very good kills on brush over 3 inches in diameter or ranging in height above 6 feet.

Location	Type of Plants	Height of Plants (Feet)	Materials Used	Date Applied 1947	% of Affected Plants
Guthrie	Scrubby Oak	2 - 10	Deisel oil & 2,4-D Ester type 1/	July 8	94.5
Guthrie	Scrubby Oak	2 - 10	Ammate 1/3 lb., 2,4-D Ester 1,000 PPM	July 8	91.7
Guthrie	Oak sprouts	1 - 2	Ammate 1/8 lb., 2,4-D Ester 2,000 PPM	July 8	84.0
Cache ^{3/}	Mesquite	3 - 6	Ammate 1/8 lb., 2,4-D salt 2,000 PPM	June 19	90.0
"	"	"	Ammate 1/8 lb., 2,4-D Ester 2,000 PPM	June 19	95.0
"	Oak sprouts	1 - 2	Ammate 1/8 lb., 2,4-D Ester 2,000 PPM	June 20	70.0
Tishomingo	Oak sprouts	1 - 2	Ammate 1/3 lb., 2,4-D Ester 2,000 PPM	July 22	93.0
"	"	"	Ammate 1/8 lb., 2,4-D Ester 3,000 PPM	July 22	95.0
"	"	"	Ammate 1/8 lb., 2,4-D Amine salt 3,000 PPM	July 22	89.0
"	"	"	Ammate 1/3 lb., 2,4-D salt 2,000 PPM	July 22	93.0
Shawnee	"	3 - 4	Ammate 1/3 lb., 2,4-D Ester 2,000 PPM	July 29	89.6

- 1/ Ten gallons of oil and 1.50 to 1.75 pounds of 2,4-D per acre.
2/ Amount of Ammate or 2,4-D used per gallon of water.
3/ Represents plants affected above the ground. A fall count indicates that 90 to 95 percent of the plants were sprouting from the roots.

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio - "With cool, cloudy days, and gentle rainfall, most of the precipitation is going into soil storage. As the soil moisture is below field capacity, there was no percolation on the lysimeters. During the period October 24 - November 16, all of the 3.05 inches of rain was absorbed by the soil and about 75 percent of the infiltration remained in the soil at the end of the period.

"Evaporation is very small--about 0.06 inch per day. There is no transpiration. Condensation of moisture onto the plants and into the ground amounted to about 0.03 inch per day. With condensation and absorption of moisture amounting to about half the evaporation, the net loss of soil moisture to the atmosphere is small.

"During the first half of November, rainfall totaled 2.17 inches. Condensation and absorption on the lysimeters totaled 0.43 inch. Total moisture added to the soil in this period was, therefore, 20 percent greater than the rainfall records showed.

"Mr. Dreibelbis reports that deep tillage (8 to 10 inches) watershed No. 111 showed greater quantities of organic matter (probably roots) at the 7-10 inch depth than plowed watershed No. 113 at corn harvesting. The deep tillage tool was an Oliver TNT (double-decker) plow with moldboards removed. The lower plow was ripping down to a depth of 8 to 10 inches. The sod was not inverted. Plowing on watershed 113 inverted the 7-inch sod slice.

Watershed	Operation	Plant residue content at 7-10 inch depth (lbs per acre-inch)
113	Plowed	118
111	Mulch-deep tillage	207

"Mr. Schiff reports the development of a standard set of curves for use in hydrograph analysis. In 1946 curves were prepared representing different theoretical accumulated infiltration amounts and corresponding infiltration rates for use in hydrograph analysis. The theoretical curves for the various scales used in hydrograph analyses at this project represent exhaustion phenomenon and plot as a straight line on semi-log paper. Recently additional curves have been prepared covering a wider range in infiltration rates and probably may be applied to soils of various hydrologic characteristics. They may also be applied when the antecedent soil moisture content is high and initial infiltration rates are low. Prior to the application of these curves to a specific storm, corrections are made for detention storage, interception storage, and depression storage. They materially speed the determination of accumulated rates and amounts of infiltration in hydrograph analyses."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"Rainfall for the month totaled 1.34 inches. The total for the year through November 30 has been 21.33 inches or 10.59 inches less than normal. There has been only 5.52 inches rain during the 6 months, June through November, compared to a normal of 15.87 inches. The rains of November have been sufficient to germinate fall planted crops (oats, Hubam Clover, winter peas, etc.) but were too late to be of much help for pasture grasses. Fields and pastures at still very dry at depths below 6 inches.

Hydrologic Studies - J. A. Ellis, Central Plains Experimental Watershed, Hastings, Nebr.-"The condition of wheat in this section, which extends into Kansas is very unfavorable. The dry fall delayed planting and a large percentage was never seeded, which is the case on the small watersheds on this project. Either barley or spring wheat will be substituted for winter wheat and seeding will be done next spring when planting conditions are more favorable. November was cold and windy with about 1.4 inches of precipitation, which produced no runoff. December 1, was a nice day and several farmers in Webster County were seeding wheat, however their chances are very slim of getting a paying crop. According to some of the older farmers wheat in 1915 was seeded about this time of year and the yields were between 10 and 15 bushels per acre, however with soil conditions as dry as they are (different than 1915) along with the late seeding it appears almost a certainty that their labor and seed have been wasted, according to information published by the Kansas Experiment Station. High prices have been an incentive for poor farming practices such as this along with an unusual amount of burning this fall.

"Following is a table showing the number of inches water in 0-1 and 0-3 foot depths as determined from the soil moisture samples. These samples were taken between November 5-9 of each year.

Native Grass						
Depth	1942	1943	1944	1945	1946	1947
Foot	Inches	Inches	Inches	Inches	Inches	Inches
0-1	4.05	1.60	2.91	3.66	3.65	1.80
0-3	11.67	5.00	9.76	8.43	9.42	5.44
Cultivated						
0-1	3.33	1.32	2.91	2.78	4.58	1.85
0-3	10.30	4.41	8.58	8.68	12.06	6.52

"These figures show that there was slightly less moisture in 1943 than in 1947. The 1944 wheat crop was a failure as a result of moisture deficiency in the fall of 1943."

Hydrologic Studies - R. B. Hickok, LaFayette, Ind.-"The correlation of crop-period runoff reductions by the conservation treatment and precipitation totals for corn was re-analyzed, including the 1947 results. The regression of runoff reductions on the precipitation totals (Jan. 1947 Report) was recomputed to be:

$$R = 0.97P - 11.36$$

when R = Crop-period runoff reduction by the conservation treatment in percentage of the total crop-period rainfall, and

P = Total crop-period rainfall in inches of water,
and X = $0.0097P^2 - 0.1136P$.

when X = Crop-period runoff reduction by the conservation treatment in inches of water.

"A frequency distribution of crop-period rainfall totals for corn (May - Sept.) was developed for Northern Indiana from all available records from 1865 to date, including over 1,400 station-seasons. The sample distribution was found to be nearly normal, and from it a normal distribution was estimated for all time. From this and the above equation, a corresponding frequency distribution of potential runoff reductions by the experimental conservation treatment was estimated. On the basis of the estimated frequency distribution, the weighted mean, potential, runoff reduction for the growing season of corn was computed to be 1.11 inches. This is an estimate of the average seasonal reduction of runoff that may be expected over a long period of years.

"Including the corn-yield data for 1947 (Oct. 1947 Report) a regression of crop yield increases by the conservation treatment on the crop-period reductions (Agric. Engin. Dept. Mimeo. #8, Purdue Agric. Expt. Sta., April 1947), indicates:

$$Y = 22.89 + 5.84X$$

when Y = corn yield increase in bushels per acre

Substituting a value of $X = 1.11$ in this equation provides an estimate of the long-time average value of $Y = 29$ bushels per acre, more or less. Of this estimated, average increase of corn yield of 29 bushels per acre which may be expected to result from the entire conservation system of the experiment, with similar soil and climatic conditions, 6 to 7 bushels could not be expected without the anticipated reduction in the crop-period runoff.

"The above estimates of the mean reduction in crop-period runoff and mean yield increases of corn with the experimental conservation treatment are based on insufficient data for a high degree of confidence.^{1/} However, they indicate an eventual usefulness of the results of the current experiment, and provide a needed, rational estimate of these results, pending a longer period of experiment.

^{1/} The error of estimate of mean runoff reduction is minimized by the relatively low frequency weights applied to values departing substantially from the sample mean values of X and P . Neglecting the error of X , the confidence interval of Y for $X = 1.11$ is approximately 29 ± 5 bushels per acre for 5% probability of error.

"Bean yields on the watersheds for 1947 are given in the following table:

Table 1.--1947 soy bean yields from prevailing and conservation treated watersheds
Purdue-Throckmorton Farm, LaFayette, Ind.

Treatment ^{1/}	Watershed No.	Yields, Bu./Acre
Prevailing	5	28.1
	8	31.8
	Av.	30.0
Conservation	6	35.3
	7	38.3
	Av.	36.8

^{1/}Prevailing treated beans were drilled in straight rows, average row spacing of 2.9 ft.; Conservation treated beans were drilled in contoured rows, average row spacing of 3.2 ft. No fertilizer applied for bean crop in either treatment, but conservation treated beans followed heavily fertilized corn, and showed marked effects of higher fertility in early growth."

Hydrologic Studies - George A. Crabb, Jr., East Lansing, Mich.--"Mr. Carbb, the new project supervisor, reported for duty on November 20. Precipitation for the month of November measured 1.49 inches at the cultivated watersheds, 1.79 inches at the wooded watershed, and 1.53 inches at the stubble mulch plots, as measured by the United States Weather Bureau type non-recording rain gages. The 40-year average rainfall at East Lansing for November is 2.48 inches. There was no runoff from any of the watersheds during the month, due apparently to alternate freezing and thawing conditions.

"Pyreheliometer data for the month of November have been tabulated. Some use has been made of these data regarding the sun's radiation by Dr. V. R. Gardner, Director, Michigan Agricultural Experiment Station, in connection with research on the fruit problem. Inquiries in regard to the availability of these data have been received from other research personnel at the college. It is expected that wider dissemination will result in more use being made of the data. Copies of the tabulated data will be made available to those desirous of receiving them by writing in to the Washington office.

Runoff Studies - N. E. Minshall, Madison, Wisc.--"The precipitation for Fennimore for November was 1.28 inches as compared with the normal of 2 inches. The total precipitation for the first 11 months is 34.1 inches or about 3 inches above normal. Temperatures varied from a maximum of 57 degrees on the 7th to a minimum of -7 on the 30th with a mean for the month of 27.5 or 8 degrees below normal.

"Precipitation at Edwardsville was 1.94 inches as compared to the normal of 2.6 inches. Temperatures varied from a maximum of 60 degrees on the 6th to 10 degrees on the 30th with a mean of 45 degrees or 8 degrees below normal. There was a slight amount of runoff on November 10 for all the areas. The War Department office at St. Louis, Mo., requested information on the rainfall for the Edwardsville stations for the period of August 12 to the 16, 1946. This information was furnished them on November 19, 1947.

"The examination of erosion-control structures was discontinued for the winter on November 6 because of unfavorable weather conditions. The examinations made this fall were nearly all on the chute type of spillway in Buffalo and Trempealeau Counties. This included both the permanent concrete type and the semi-permanent creosote timber structures. Nearly all of the timber structures have failed completely in a period of less than 10 years and there were also a few failures noted among the concrete type. A comparison of the cost of these two types of structures where available, indicates that the cost of the timber structures was about 80 to 90 percent of the cost of the concrete structure. With this small difference in initial cost, it would appear that only a permanent type of construction could be justified.

"The most serious difficulty with the structures appeared to be a damage to fills from burrowing animals. Only a small percentage of the farmers are at all concerned about maintaining fill or the structure. The instructions to the farmers to fence out their fills has resulted in a rank growth of grass and weeds which has provided an excellent hiding place for the burrowing animals. The indications are that a small amount of grazing or keeping the vegetation on the fill mowed might prove beneficial."

Sedimentation Studies - L. C. Gottschalk, Washington, D. C.--"During the month work was started on preparation of maps and cross sections for calculating the results of sedimentation surveys made of Spartanburg Reservoir, Spartanburg, S. C., and Lake Tonganoxie, Tonganoxie, Kans. Although computations of survey data have not been completed for Lake Tonganoxie, preliminary inspection of field data indicates a high rate of sediment production from the watershed above this reservoir. Nearly 50 percent of the watershed is in cultivation.

"Carl B. Brown prepared a paper entitled 'Damages Resulting from Uncontrolled Runoff and Silt Movement' for presentation at the meeting of the Soil Conservation Society of America to be held at Omaha, Nebr., in December. In this paper he discusses the recent flood damages in the Missouri River Basin, the effect of sedimentation on reduction of reservoir capacities of proposed reservoirs under the Pick-Sloan plan, and the nature and extent of sedimentation damages to various types of enterprises in the United States."

Drainage Studies - M. H. Gallatin, Homestead, Fla.--"During the early part of the period to October 13, 8 to 14 inches of rain were recorded at our various gages throughout this area. On October 11, 6 to 9 inches were recorded in two heavy rains, one occurring in the early afternoon and the other in early evening. This was the forerunner of the small hurricane that passed a little to the north of this area. With the water table already high throughout this area this heavy intense rain raised the water table for the most of the area to ground surface or above. This water table at or in many cases above ground surface remained for 7 to 10 days and as a result, the loss of young trees was rather high in this area. The high water table recorded on the 13th of October from all I can find out equals the water table which occurred in 1929 about this same time of the year. Our well readings for the period show that though we had from 8 to 14 inches of rain during the early part of the month and have recorded a record high for this area, readings at the end of the period show that actually our water table is lower than those readings made on September 30. This loss in water table is greater in the immediate coastal area

where the loss in water table was 0.25 to 0.36 inch. Gains in water table from well No. 13 north were recorded. The gain averaged 0.17 inch. Our data indicate that there is a tremendous outflow of water along the Eastern coastal area.

"Readings on the various mulch plots during the early part of this period remained at a minimum. Since the 13th readings on the natural cover, check and shavings plots have increased more rapidly than for the pine straw and grass mulch plots. Pine straw and grass are superior so far as moisture conservation. Samples taken for nitrate analysis are all low due to the leaching by the heavy rains.

"In connection with our nitrate leaching studies, during the first of the period losses for all of the treatments with the exception of cyanmid were high. The areas on which cyanmid is being used, while the available portion was lost by leaching, these areas due to the nitrogen reserve built back shortly after the rains stopped. Data to date indicate that during the period of heavy rains high organic-type fertilizers should be used to minimize leaching and maintain adequate nitrates for good plant growth.

"Due to excessive high water in the Miami area no samples were collected during this period. Sampling in the Homestead area for this period indicates that on the two canals, Goulds and Military, where chloride barriers are in operation and have been in operation for some time, the concentration of chlorides back of these structures is low. For the North Canal the high concentration of chlorides extended back from the Bay about 1-1/2 miles. It shall be interesting to see what effect these structures in operation have upon the area back of them during the coming crop season."

Supplemental Irrigation - James Turnbull, Lake Alfred, Fla.--"Heavy rains during November totaling almost 7 inches, as compared with a normal rainfall of 1.37 inches sent the excess for the year to 11.99 inches. The water table and lake elevation dropped at the beginning of the month but the heavy rains soon reversed the trend with the result that the lake level is at the highest point since records were established 18 months ago and is 2.5 feet higher than at the same time last year. Water-table elevations are 3.5 feet above those of November 1946.

"In spite of the extremely favorable moisture distribution during the year fruit quality is generally considered lower than usual with lowered juice content and lowered solids content being the most common sources of dissatisfaction. Many of the growers report early oranges drying out soon after reaching minimum maturity standards for shipment. Further investigation of difficult to wet soil reveals that "dry bodies" are becoming smaller and only in groves in which the disease commonly referred to as "decline" has developed does there appear to be any appreciable amount of dry soil left."

Supplemental Irrigation - J. R. Carreker, Athens, Ga.--"Rainfall at the irrigation plots in November totaled 8.78 inches. This was approximately a half inch more than the all time high November rainfall recorded by the U. S. Weather Bureau at Athens, Ga., since 1885. The daily amounts measured were; November 1-2 -- 1.74 inches; 5 -- 0.24 inch; 7 -- 1.46 inches; 10 -- 2.58 inches; 14 -- 0.35 inch; 15 -- 0.85 inch; 18 -- 0.75 inch; and 22, 23, and 24 -- 0.81 inch. Intensities from all rains were generally low.

"A paper entitled 'Supplemental Irrigation Research in Georgia' was written by John R. Carreker and W. J. Liddell. Approval of this paper was obtained for presentation at the ASAE Winter Meeting in Chicago December 15, 1947.

"Soil moisture records that were made at weekly intervals throughout the summer with plaster of Paris blocks and a Bouyoucos bridge were graphed for the pastures, vegetables, and corn. These graphs indicate the following conditions:

Pastures

1. In the irrigated pasture, the soil remained wet throughout the summer at 18 inches depth. The soil at 6 inches under the surface showed considerable drying out between rains and irrigations.
2. The soil at 6 and 18 inches depth was very dry during a considerable portion of the summer in the unirrigated pastures.

Corn

1. The soil in the irrigated corn was thoroughly wetted at the 6-inch depth with each sizeable rain and irrigation. The soil at 18 inches depth dried out, even under irrigation on certain plots during August and remained dry the remainder of the summer.
2. The soil at the 6- and 18-inch depths in the unirrigated plots became dry about the first of July and remained dry throughout the summer. No rain wetted the unirrigated soil to 6 inches depth, even though the August rainfall pattern was: August 2 -- 0.62 inch; 6 -- 0.35 inch; 8 -- 0.13 inch; 11 -- 0.89 inch; 13 -- 0.03 inch; 19 -- 0.07 inch; 22 -- 0.95 inch; 24 -- 0.01 inch; and 26 -- 0.06 inch.

Vegetables

Soil moisture measurements were made under okra at 6 inches depth only. The moisture readings showed:

1. Irrigation application of 1.0 inch did not thoroughly wet the soil to 6 inches depth at any time during the summer.
2. The soil in the unirrigated plots remained dry at 6 inches depth from early in July until heavy rains fell in October.

"These soil moisture records should be repeated in considerably more detail in 1948. The Bouyoucos system appears to be quite satisfactory for determining when soils need irrigating."

IRRIGATION DIVISION

Flow of Water in Conduits - F. C. Scobey, Berkeley, Calif.-"On November 25 preparatory work was undertaken on tests of the 71-mile water-supply line conveying additional water from the Metropolitan Water District of Southern California to the city of San Diego. Conferences were held during the latter part of the month with officials of the city of San Diego, Metropolitan Water District, Bureau of Reclamation, Navy, and the San Diego County Water Authority. Test points have already been selected for profile prints and equipment will be installed and readings recorded."

Water Spreading for Ground Water Storage - A. T. Mitchelson, D. C. Muckel, and H. K. Rouse, Berkeley, Calif.-"As a part of their cooperation in our water-spreading program, the Bureau of Reclamation assigned one of their bucket drill rigs to work on the Madera plot where five holes 30 inches in diameter were drilled to a depth of 20 feet. These holes have been examined for most geological and soil characteristics. Samples will be obtained from certain specific depths within the soil profile where there is evidence of clay pan, alkali strata, unfavorable sodium-calcium ratio, or other conditions which might affect water penetration.

"Also during November a diamond drill rig was assigned to the Madera plot for the purpose of drilling three 3-inch holes to a depth of 20 feet below ground water. Each of these three holes which are approximately 60 to 70 feet deep are cased with 1-1/2 inch casing and depth to water will be read daily by the plot attendant. About 12 feet from each of the deep observations wells, a shallow well will be drilled using a hand auger. The shallow wells will be drilled to the first layer of hard-pan and cased with stove-pipe casing and the depth to water will be read each time observations at the deep wells are taken. None of the well casing are perforated. Samples have been taken for soil moisture determinations at every 2 feet of depth, or at points of textural changes within the soil profile for the full depth of 60 feet."

Upper Santa Ana River Valley - Dean C. Muckel, Pomona, Calif.-"Some progress was made on the job of setting up monthly consumptive use values for the various crops in the Chino Basin. At a conference with Harry F. Blaney, it was decided monthly values will be determined only for the winter or non-irrigation season and seasonal values will be shown for the irrigation season. This information is required for a computation of deep penetration from rains and irrigation water."

San Fernando Valley Investigation - William W. Donnan and V. S. Agronovici, Los Angeles, Calif.-"Work was started on a peg log model of the underground stratification of the soils in the San Fernando Valley Soil Conservation District. Using quadrangle topographic sheets on a scale of 1,000 feet to the inch for a base, the logs from about 100 wells were transferred to 1/4-inch dowel pegs. It is hoped that the peg logs will reveal the nature and extent of water-bearing material and its influence on the drainage problem. The model gives a picture of the stratification sequences and aquifer distribution in the underground basin. The indications are that the aquifers are extremely irregular and lense like. They occupy less than 30 percent of the entire log. The great predominance of material logged is clay."

Imperial Valley Drainage Investigation - William W. Donnan, Los Angeles, Calif.-"Investigations were started on installed farm-tile systems which were designed using the Tile Spacing Formula. In making these field studies, piezometers are located adjacent to and out from the tile lines and the water-table position throughout an irrigation cycle is determined at the same time a tile effluent recorder is installed on the tile outlet to record the regimen of flow and the total amount of water drained during the irrigation cycle. Measurements are also made of the amount of water applied per irrigation and the amount of water wasted to determine input to the soil. These data should reveal whether the tile system is functioning according to design, whether the spacing is adequate, and whether the basic assumptions made in developing the tile spacing formula are correct."

Upper Colorado River Basin - Harry F. Blaney, Los Angeles, Calif.-"At the request of the Engineering Advisory Committee of the Upper Colorado River Basin Compact Commission, a preliminary office study was started on consumptive use and water requirements. The Upper Colorado River Basin is an area tributary to the Colorado River above Lee Ferry. This area is larger than New York, Pennsylvania, and New Jersey combined. It includes parts of five Rocky Mountain States (Ariz., Colo., Ne. Mexico, Utah, and Wyo.). There are 70,696,000 acres of land in the Upper Basin, of which 1,325,000 acres are irrigated and 272,000 farmed without irrigation. The crops include alfalfa, wild hay, wheat, barley, corn, oats, deciduous fruits, potatoes, sugar beets, and dry beans. Table 1 shows the acreage irrigated, as reported by the United States Bureau of Reclamation.

Table 1.--Irrigated areas in the Upper Colorado River Basin

Division	Arizona	Colorado	New Mexico	Utah	Wyoming
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Green		105,870		229,120	247,540
Grand		564,670		8,000	
San Juan	6,000	132,300	38,000	37,700	
Total	6,000	802,840	38,000	274,820	247,540

"Farming without irrigation is generally unsuccessful in most areas of the Upper Basin because of the uncertain rainfall. However, it is practiced in some areas under favorable climatic conditions. In general, at altitudes where rainfall is sufficient during the summer to grow crops without irrigation, the season is too short for crops to mature. The annual precipitation ranges from about 6 inches at Green River, Utah, to 17 inches at Kendall, Wyo., and the summer precipitation ranges from 3 inches in the lower valleys to 9 inches in the higher areas."

Irrigation Studies - Geo. D. Clyde, Logan, Utah.-"Dean Fuhrman reports, "All streamflow records for the 1945-46 year have been checked and verified and recorded, together with the forecast correlation data. The forecast data and the streamflow records are now up to date and ready for the coming forecast season. All the runoff data, precipitation data, forecast-analysis data, snow-course maps, and correlation data have been recorded in permanent form on bond paper and carbon-backed for easy reproduction. As new data are added it will only be necessary to check current figures."

Fuhriman also reports the issuance of a summary showing a complete compilation of all the snow-course data in the State of Utah since the program began. This mimeographed summary is available for in-Service distribution.

Willis C. Barrett reports field tests on the snowmobiles which have been developed during the past year. The No. 1 snowmobile is the SCS model, the No. 2 snowmobile is the USGS model. The USGS model was tested on the first of the month in snow about 20 inches deep. As soon as it was put into operation, curtain closed, fumes from the exhaust became very strong making it necessary to completely remodel the exhaust system. Ice got into the sprockets and caused considerable difficulty. The ice would form beneath the sprocket chains causing the effective diameter of the sprocket wheel to increase and increase the tension on the chains. This caused the chains to break. To help keep the ice out of the sprockets de-icing chisels were constructed.

C. W. Lauritzen reports, "Permeability measurements to determine the influence of dissolved salts on the permeability of a number of soil and soil Bentonite mixtures under study in connection with canal lining were continued. Some moisture retention measurements with Pressure Membrane equipment designed to correlate water retention with shrinkage were continued... Some exposure tests have been set up to determine the deterioration associated with the use of rubberized materials as canal linings. These materials are approximately 1 mm. in thickness and at present are restricted to three types:

1. Butyl rubber sheet
2. Butyl coated cotton-drill
3. Butyl coated fiberglas

The exposure tests are of two types. In the first, small pieces of the materials were partially buried in a soil compost which is maintained at a temperature of 80°F. In the second, other small pieces were placed outdoors to weather. The deterioration resulting from these exposure tests will be evaluated later by subjecting the samples to standard Commercial tests such as tensile-elongation and tear resistance. Sufficient of the fiberglas, 100 linear yards, was received to line a short section of ditch. This lining will be installed this coming spring."

J. Howard Maughan reports, "In connection with the study of Utah drainage districts a summary is being prepared of the effects on drainage of court decisions and interpretations of the Utah drainage district law. A number of important decisions, affecting the taxation of districts, were rendered during the 1930's as a result of which the taxing powers of districts, the responsibilities of districts and of land owners were clarified. The effects of court decisions on the financing of drainage districts are important. The summary being prepared will be a part of the forthcoming bulletin reporting the study."

Irrigation Studies - C. E. Houston, Reno, Nevada, "Arrangements were completed for holding local forecasts meetings in the spring of 1948 at Fallon, Yerington, and Minden, Nev. These meetings will be attended by County Agents, Soil Conservation District Leaders, Forest Rangers, Irrigation District Representatives, State Engineer, District Engineers (Surface and Ground Water) USGS, and myself. The purpose of these meetings will be for each representative to contribute pertinent information which will aid in arriving at a forecast for five gaging stations on the Walker and Carson Rivers. Probably the most

valuable information to be obtained from the meetings will be that the County Agents and Irrigation District Personnel will have first hand information on future water supplies to pass on to their cooperators.

"During the recent trip to Arizona three snow courses were permanently marked with iron pipes set in concrete. Two new snow courses were established north-east of Tucson which will give valuable information pertaining to water supplies and range condition at the higher elevation of southern Arizona. Coronado National Forest personnel have agreed to survey these courses and report to this office. Informal arrangements were agreed upon with Salt River Valley Users Association to increase their monetary contribution in order to hire a snow surveyor to assist Indian Service Personnel on surveys on the Salt River Watershed. It was also agreed that additional high elevation courses will be established on this watershed next summer.

"The water supplies in Arizona are in very poor condition. San Carlos Reservoir with a capacity of 1,200,000 acre-feet serving approximately 90,000 acres of alfalfa and cotton is empty. To alleviate this condition would require a snow pack on the watershed much greater than has ever before been measured. The Salt River Reservoirs with a capacity of about 2 million acre-feet now contain about 200,000 acre-feet. This water shed will also need an extremely heavy snow pack.

Irrigation Studies - James C. Marr, Boise, Idaho.-"At the request of Mr. Blake J. Lowell, Director, Riverside Canal Co., Caldwell, Idaho, plans are being made to furnish the design and specifications for installing a Vortex tube sand trap in Riverside Canal near its point of diversion from Boise River near Caldwell, Idaho. Mr. Ralph Parshall who developed the Vortex tube sand trap will furnish the technical information and Messrs. Marr and Criddle of our Boise, Idaho office will act as consultants in the actual installation of the structure.

"In connection with the claims of the various States to the waters of Colorado River under the Colorado River Compact plans were developed with the Utah State Engineer for cooperative study of the use of irrigation water in the Colorado River Area in Utah. Mr. Wayne D. Criddle is representing the Division of Irrigation Soil Conservation Service in this work. Two study areas were chosen on which to determine valley consumptive use by the "Inflow-Outflow" method and by the "Integration" method. The Ashley Valley (Vernal Area) was believed to be representative of the Uinta Basin and Ferron Creek Area was chosen in Castle Valley. Present plans call for an evapo-transpiration experiment station in one of the study areas. Consumptive use will also be studied by the "Moisture-depletion" method through taking soil samples on representative fields throughout the growing season.

"The Utah Agricultural Experiment Station is expecting to join in on the investigation and assist the Division of Irrigation in analyzing the data and preparing a report on the results.

"The tabulation of the Snow Survey data for Columbia River Basin (exclusive of that for the State of Oregon) has been compiled and is now in the process of being mimeographed. A summary of these data was published in 1942. The new summary will include all of the data that has been procured through the years through 1947.

Irrigation Studies - Carl Rohwer, Ft. Collins, Colo.-"Homer J. Stockwell spent several days in the field during November making arrangements for snow surveys on the courses in the Rocky Mountain National Park and on the headwaters of the Poudre and Laramie Rivers. The summary of the Missouri and Arkansas River snow courses was commenced. The report on the Rio Grande drainage courses was published early this month.

"Tests of the loss of head through an 8-inch standard swing check valve were completed at the Bellvue laboratory by Carl Rohwer. These tests showed that there was little correlation between the losses through swing check valves of different sizes although the results for each size were very consistent. The reason for this condition has not been determined. Equipment is being assembled for the Well Screen Project and the problems involved in conducting the tests are being studied. Printing of the report on Seepage Losses from Irrigation Channels is progressing satisfactorily.

"After attending the meeting of the National Reclamation Association at Phoenix, R. L. Parshall went to California to inspect the construction of the large sand trap designed by him for the Consolidated Irrigation District at Selma. This trap is being built to remove the bed load from the main canal, which has a capacity of 2,000 cubic feet per second. Mr. Parshall called at the Berkeley Office while in California. Since his return to Colorado he has been working on the report of 1947 meeting of the Colorado River Forecast Committee. He also designed a sand trap for the Riverside Canal near Boise, Idaho.

Irrigation Studies - Stephen J. Mech, Prosser, Wash.-"The month of October had an unusually large amount of precipitation. A total of 2.50 inches were measured at the station as compared with a 21-year average of 0.70 inch. This is the heaviest precipitation for the period of record and the dry-land wheat prospects in the vicinity are very good."

1/27/48

